

Hideaki OHBA* & Hiromi TAGAWA*: **A note of *Orostachys malacophyllus* (Pallas) Fischer and its related taxa from northern Japan. Notes towards a monograph of the genus *Orostachys* (Crassulaceae) (2)****

大場秀章*・田川裕美*: 北日本産アオノイワレンゲの考察.
ベンケイソウ科イワレンゲ属植物覚書 (2)

Several taxa related to *Orostachys malacophyllus* or *O. iwarenge* have been described or recorded from northern Japan (Makino 1902, 1910, Ohwi 1954). Makino (1902) described an *Orostachys* under the genus *Cotyledon* as *C. malacophylla* var. *boehmeri*. Makino took notice of its conspicuous caespitose nature in giving the Japanese name. Makino (1910) described another *Orostachys* as *Cotyledon aggregata* from Shobuda, near Sendai, and a cultivated stock at Botanical Gardens, Koishikawa, University of Tokyo, differing from *O. malacophyllus* by the smallness in all parts, the short stolons, and the aggregated habit. At the same time Makino recorded *O. malacophyllus* itself from Okushiri, Hokkaido and Tsushima Island, Kyushu. Hara (1935) transferred these two taxa described by Makino to the genus *Orostachys*, and treated as distinct species.

Ohwi (1954) described *Orostachys furusei* from Rebun Island, Hokkaido in having conspicuously glaucous body, long stolons and smaller, obovate leaves attaining 1-2 cm long and 5-10 mm wide. Later Ohwi (1965) united all taxa described from northern Japan into a single species, *Sedum iwarenge* (Makino) Makino, and reduced these three taxa into the varieties. Ohwi has held an opinion that *O. malacophyllus* does not occur in Japan.

Ohba (1981) considered *O. boehmeri* to be conspecific with *O. iwarenge* (Makino) Hara mainly in having glaucous nature, and *O. aggregatus* as the synonym of *O. malacophyllus* (Pallas) Fischer. Hara (1985) treated *O. aggregata*

* Department of Botany, University Museum, University of Tokyo, Hongo 7-3-1, Tokyo 113. 東京大学総合研究資料館.

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geatus tentatively as the synonym of *O. malacophyllus*, but thought *O. boehmeri* as the variety of *O. malacophyllus* on the basis of his observation about the form of their winter rosettes.

It is noticeable that some of these *Orostachys* described from northern Japan are glaucous as *O. boehmeri* or *O. furusei*, and others are not glaucous as *O. aggregatus*. It is, however, uncertain whether both glaucous and stoloniferous or caespitose nature are stable or not. This note aims to elucidate the glaucous and stoloniferous or caespitose nature as well as the variation of floral features, and discuss about their taxonomic treatment.

Material and methods The authors gathered *Orostachys* from several localities in northern Japan, and some of them were cultivated at Tokyo. Microstructures were observed with a Hitachi S-700 scanning electron microscope (SEM) at 5 kV, and photographed using Fuji FP3000B film. Samples taken from the middle portion of mature leaves were fixed in 80% ethyl alcohol. After dehydration and critical-point dried, they were mounted on stubs with aluminium, and coated with gold-palladium in an Eiko IB5 sputter coater. Vouchers are deposited in TI. The shape and size of flowers and their parts were observed and dissected under a binocular microscope. Specimens deposited in A, BM, K, KYO, MAK, TNS, and TI were examined.

Result and discussion Figs. 1 and 2 show the microstructures of leaf surface. It is interesting that all the taxa examined have stomata with a pair of guard cells on both surfaces of the leaves. It shows that structural differences between glaucous and non glaucous forms are obscure. The epidermal cells on the lower side of the leaves are sinuate (Fig. 1). The unevenness of the outer surface of the epidermal cells is conspicuous, but hardly different in degree among the species examined (Fig. 2). *O. iwarenge* agrees with *O. boehmeri* and also *O. aggregatus* in the shape of the epidermal cells.

The stoloniferous nature does not correlate with glaucous nature. Therefore, all the four combinations in the presence or absence of stolons and glaucous nature are present in the northern Japanese *Orostachys*. In *O. aggregatus* it has known to occur both stoloniferous and stolonless individuals in the same localities of the Japan Sea side (e.g., Oga Peninsula) and the Pacific side (e.g., Hachinohe). *O. aggregatus* is always not glaucous. Except the glaucous nature *O. furusei* resembles *O. aggregatus* in both floral and vegetative features. Some individuals of *O. furusei* lack stolons. So that, *O. furusei*

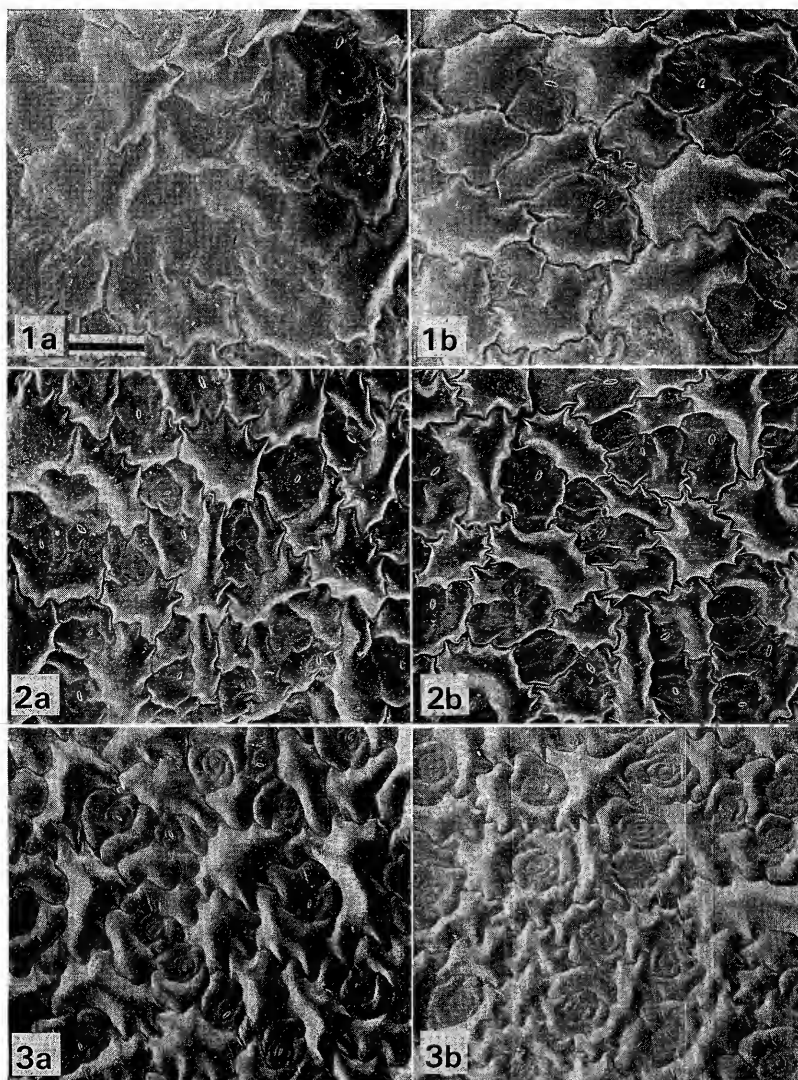


Fig. 1. Upper (a) and lower (b) surfaces of the leaves of *Orostachys malacophyllus* and *O. boehmeri*.
1. *O. malacophyllus* var. *aggregatus*. 2. *O. malacophyllus* var. *iwarenge*. 3. *O. boehmeri*.
Bar indicates 100 μ m.

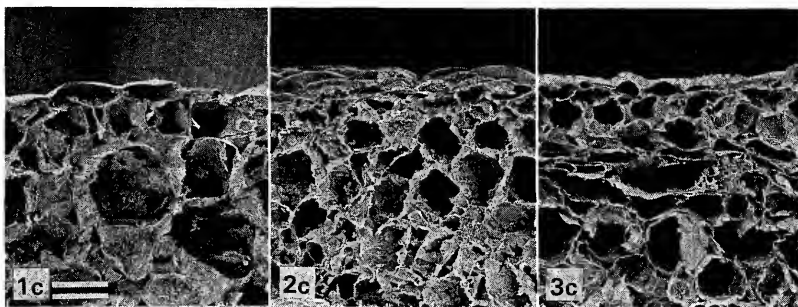


Fig. 2. Cross section of the leaves of *Orostachys malacophyllus* and *O. boehmeri*, showing unevenness of the upper surface. 1. *O. malacophyllus* var. *aggregatus*. 2. *O. malacophyllus* var. *iwarenge*. 3. *O. boehmeri*. Bar scale indicates 100 μ m.

is thought as the stoloniferous and conspicuously glaucous representative of *O. aggregatus*, the most of which are stolonless but not glaucous. All *Orostachys* except *O. boehmeri* have a tendency to become stoloniferous under cultivation, and then, are thought as potentially more or less stoloniferous. However, the caespitose nature appears a property of *O. boehmeri*, that is, *O. boehmeri* is always caespitose and also glaucous. Moreover, the rosettes of *O. boehmeri* are globose differing from those of others with suberect or ascending leaves. As pointed out by Hara (1985) *O. boehmeri* differs also from *O. iwarenge* particularly in the shape of rosette with suberect or ascending leaves as that of *O. aggregatus*.

Fig. 3 shows the petals with a stamen from some representative specimens of *O. malacophyllus*, *O. boehmeri*, *O. aggregatus* and *O. fursei*. The shape and size are very variable, and difficult to be distinguished sharply from each other.

O. malacophyllus is distributed in the region from Tien Shan, Mongol to Japan through N China, Amur and E Siberia and shows an extremely wide range of variation in both vegetative and floral characters. The specimens from E Siberia and N China (including Dauria, the type locality), have broadly oblong-obovate petals and the stamens always longer than the petals. These features are also found in the specimens collected from Fukuoka Prefecture and Tsushima Island, Kyushu, which well agree with the type of *O. genkaiensis* Ohwi.

The *Orostachys aggregatus* is slightly different from *O. malacophyllus* or

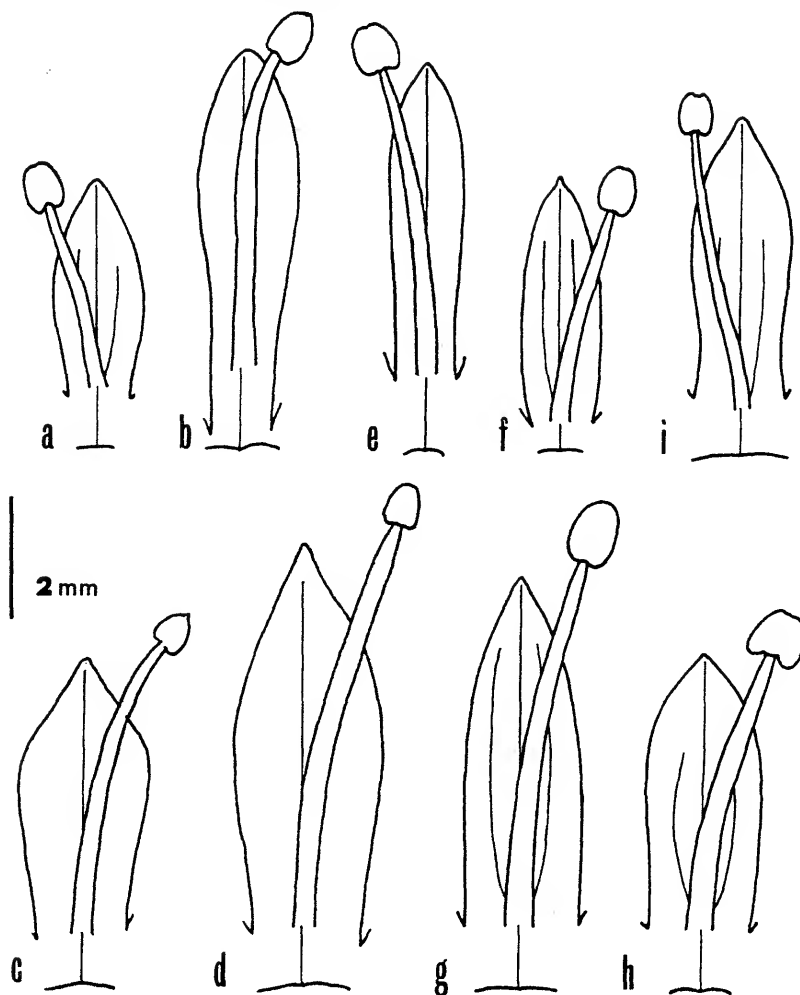


Fig. 3. Petals with a stamen of *Orostachys malacophyllus* and *O. boehmeri*. a. *O. boehmeri* [Hokkaido, Mt. Oobira-san. Hara et al. s.n.]. b. *O. malacophyllus* var. *iwarenge* [Yamaguchi Pref. Ohba s.n.]. c. & d. *O. malacophyllus* var. *malacophyllus* [c: USSR, E Siberia. TNS 235171; d. Fukuoka Pref., Hichaskuda. Togashi s.n.]. e-h. *O. malacophyllus* var. *aggregatus* [e: Hokkaido, Okushiri. Moran 5563; f: Akita Pref., Oga. Muramatsu s.n.; g: Yamagata/Miyagi Pref., Oozuma. Ohba s.n.; h: Hokkaido, Rebun Isl., Momoiwa. Midorikawa s.n.]. i. *O. malacophyllus* subsp. *lioutchenngoi* [China, Inner Mongolia, Manzhouli. Liou 8336].

O. genkaiensis in some floral features showing in Fig. 3. That is, the petals are not broadly oblong-obovate but linear, narrowly or moderately oblong, and the stamens are not prominently longer than the petals. *O. aggregatus* is regarded as a local variety of *O. malacophyllus* with wide range of distribution. It is also noticeable that any stoloniferous or caespitose forms have not been recorded in *O. malacophyllus* from the mainland of Asia and Kyushu. *O. boehmeri* greatly differs from the others in having globose rosettes and always conspicuously caespitose nature, and is considered as a distinct species.

O. iwarenge with glaucous stems, leaves, bracts and calyces, differs slightly from *O. malacophyllus* in having narrowly oblong petals with round apex, oblong or rarely broadly oblong-lanceolate calyx-lobes, oblong secondary bracts, and anthers before dehiscence usually deep yellow, and is also regarded as a variety of *O. malacophyllus*. *O. boehmeri* and the Japanese varieties of *O. malacophyllus* are distinguishable from each other as follows:

- 1a. The rosettes globose; plants always glaucous and conspicuously caespitose *O. boehmeri*
- 1b. The rosettes consisting of suberect or ascending leaves; plants not caespitose but often stoloniferous *O. malacophyllus*, 2
- 2a. The rosulate leaves oblong or broadly oblong-ob lanceolate; stamens apparently longer than the petals; plants without stolons and non glaucous var. *malacophyllus*
- 2b. The rosulate leaves broadly oblanceolate or obovate; stamens a little longer than the petals; plants with or without stolons and glaucous nature3
- 3a. Plants always glaucous, hardly stoloniferous; anthers before dehiscence deep yellow; petals narrowly oblong with round apex var. *iwarenge*
- 3b. Plants sometimes glaucous and stoloniferous; anthers before dehiscence deep purplish-red; petals linear to oblong with obtuse apex .. var. *aggregatus*

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本州東北地方と北海道から記載されたイワレンゲ属のコモチレンゲ、コイワレンゲ、レブソイワレンゲの分類について考察を行った。これらはみな *Orostachys malacophyllus* に類似し、主に植物体が粉白すること、走出枝を出すこと、仔吹きをし叢生するなどの特殊性によって上記の種から区別されてきた。観察の結果、叢生する性質をもつモチレンゲ *O. boehmeri* は他とは異なる球形のロゼットをつくり、その葉形も異なるが、他の分類群では観察した諸形質は変化に富み、分類群を区分するに足る質的な違いは見いだせなかった。

コイワレンゲとレブソイワレンゲは同一の分類群であり、*O. malacophyllus* の北日本に産する地方型とみられる。Var. *malacophyllus* の基準産地のダフリヤを中心とする中国北部、シベリア東部の個体とは、花卉のかたち、花卉よりも明かに長い雄しべをもつ点で区別される。しかし、九州北部には var. *malacophyllus* そのものが産する。このことは牧野富太郎 (1910) が最初に報告した。ゲンカイイワレンゲ *O. genkaiensis* Ohwi はこの異名となるので、var. *malacophyllus* にはゲンカイイワレンゲの和名が使える。北日本産、即ち var. *aggregeatus* にはアオノイワレンゲまたはコイワレンゲの和名がある。

□ 斎藤信夫：花神巡礼—草木との語らい 212 pp. 1990. たねの会 (青森県東津軽郡蟹田町上蟹田 62-2). ¥1,500 (税込). 種子の発芽に始まり生長・開花・結実・枯死と決まったように繰り返される植物の生活の様子を眺めていると、たとえば花の咲き出す時期や花のからくりにしても、種類によって違っていて、それぞれ最良の出番を知っているようにみえる。それは何か「花神」といったような者が教え導いているのではないかとさえ思われる。このように著者は書いているが、本書は青森県津軽半島の町で中学校の理科を担当した15年間に、同地方で観察した記録48項目 (各独立) を収めた読物である。植物と仲よく接すること、自分の目で確かめることの喜びと共に、自然の奥深さを教えてくれる書物である。

(伊藤 洋)